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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/621,292	07/17/2003	Min-Chul San	8021-160 (SS-18118-US)	2476

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EXAMINER	
PHAM, THANH V	

ART UNIT	PAPER NUMBER
2823	

MAIL DATE	DELIVERY MODE
06/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

TH

Advisory Action Before the Filing of an Appeal Brief	Application No.	Applicant(s)	
	10/621,292	SAN ET AL.	
	Examiner	Art Unit	
	Thanh V. Pham	2823	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 04 June 2007 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires ______months from the mailing date of the final rejection.
   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☐ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ■ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: _____.
   Claim(s) rejected: _____.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: see attched.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). _____
13. ☒ Other: See Continuation Sheet.

TP
06/08/2007

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Continuation of 13. Other: also attached are three pages of Wikipedia definition and a page of the Classification.

Response to Arguments

1. Applicant's arguments filed 06/04/2007 have been fully considered but they are not persuasive. Further, the submission does not comply with 37 CFR 1.121 as claim 12 does not appear to be amended; therefore, the status identifier is incorrect.

2. In response to applicant's statement that "Takeuchi does not expressly mention using alloys for its metal layer for silicide", applicant is directed to the quoted passage on page 3 of the office action mailed 04/03/2007 wherein

> a metal which can form silicide when reacted with silicon (this metal will be hereinafter called "silicide forming metal"). This silicide forming metal is, for example, **refractory metal**, more specifically, at least one kind of metal selected from a group of tungsten (W), *cobalt* (Co), *titanium* (Ti) *and* nickel (Ni). The first metal can be formed by a known thin film forming technology, such as sputtering or CVD, col. 7's lines 30-37.

As defined in Wikipedia of refractory metal mentioned in Takeuchi's passage

> Refractory metals are characterized by their extremely high melting points, which range well above those of iron and nickel. When the refractory metals are considered to be those metals melting at temperatures above 2123 K, twelve metals constitute this group: tungsten (the melting point 3683 K), rhenium, osmium, tantalum, molybdenum, iridium, niobium, ruthenium, hafnium, zirconium, vanadium, and chromium.

Applicant is further directed to Class Definitions by Class Number in the Classification used in and out of USPTO office wherein the definition of class 438, subclass 582 is as follow:

> Using refractory group metal (i.e., titanium (Ti), zirconium (Zr), hafnium (Hf), vanadium (V), niobium (Nb), tantalum (Ta), chromium (Cr), molybdenum (Mo), tungsten (W), or alloy thereof)

in which all of the materials in the parenthesis belong to refractory group metal. (Both documents are attached in this office action). Therefore, those claimed materials, which

are not explicitly listed in Takeuchi's, are implicitly mentioned in the term "refractory metal". (Partial of this argument is also responded as in the office action mailed 04/03/2007, section 5.)

3. In response to applicant's statement that "the Maex reference cannot cure the above deficiencies" and "Maex teaches away or leads away from providing a Ni-based layer comprised of a nickel alloy for silicide by teaching that it is preferable to form alloys wherein nickel is included in the alloy in lesser amounts than the other constituent(s) of the alloy"; this argument is respectfully traversed because, although not taught as a preferred embodiment, Maex teaches this embodiment nonetheless, and disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In re Susi, 169 USPQ 423 (CCPA 1971). The extracts in the rejection wherein the Maex reference discloses

> The first layer structure can also include a cobalt-nickel alloy with the <u>nickel</u> content varying <u>from</u> 0 <u>to</u> 100%; ... Also, <u>other metals</u> such as <u>Pt</u> or <u>Pd</u> can be chosen as elements that are present in the first layer structure.... or the elements <u>Pt</u> and <u>Pd</u> can be added <u>in minor amounts</u> to the first layer structure. Also, <u>other elements</u> such as Au, Ir, Os, Rh, Ti, <u>Ta</u>, W, Mo, Cr, C, and Ge <u>can be part of</u> the first layer structure.

This passage means that with 100% nickel, the material is not all cobalt; with less than 100% nickel and the added material, <u>in minor amounts</u>, of one of Ta, Pd, Pt, e.g., the combination satisfies the requirement of all claims.

"A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including

nonpreferred embodiments. Merck & Co. v. Biocraft Laboratories, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). Even a teaching away from a claimed invention does not render the invention patentable. See Celeritas Technologies Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998), where the court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed." To further clarify, a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose, or even preferability of the invention for another purpose.

4. Therefore, the rejections in the office action mailed 04/03/2007 are maintained.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh V. Pham whose telephone number is 571-272-1866. The examiner can normally be reached on M-T (6:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TuP
06/07/2007

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570 **FORMING SCHOTTKY JUNCTION (I.E., SEMICONDUCTOR-CONDUCTOR RECTIFYING JUNCTION CONTACT)**

571 . Combined with formation of ohmic contact to semiconductor region

572 . Compound semiconductor

573 .. Multilayer electrode

574 ... T-shaped electrode

575 ... Using platinum group metal (i.e., platinum (Pt), palladium (Pd), rodium (Rh), ruthenium (Ru), iridium (Ir), osmium (Os), or alloy thereof)

576 .. Into grooved or recessed semiconductor region

577 ... Utilizing lift-off

578 ... Forming electrode of specified shape (e.g., slanted, etc.)

579 .... T-shaped electrode

580 . Using platinum group metal (i.e., platinum (Pt), palladium (Pd), rhodium (Rh), ruthenium (Ru), iridium (Ir), osmium (Os), or alloy thereof)

581 .. Silicide

[redacted] . Using [redacted] (i.e., titanium [redacted], zirconium [redacted], hafnium [redacted], vanadium [redacted], niobium [redacted], tantalum [redacted], chromium [redacted], molybdenum [redacted], tungsten [redacted], or alloy thereof)

583 .. Silicide

584 **COATING WITH ELECTRICALLY OR THERMALLY CONDUCTIVE MATERIAL**

585 . Insulated gate formation

586 .. Combined with formation of ohmic contact to semiconductor region

587 .. Forming array of gate electrodes

588 ... Plural gate levels

589 .. Recessed into semiconductor substrate

590 .. Compound semiconductor

591 .. Gate insulator structure constructed of plural layers or nonsilicon containing compound

592 .. Possessing plural conductive layers (e.g., polycide)

593 ... Separated by insulator (i.e., floating gate)

594 .... Tunnelling dielectric layer

595 .. Having sidewall structure

596 ... Portion of sidewall structure is conductive

597 . To form ohmic contact to semiconductive material

598 .. Selectively interconnecting (e.g., customization, wafer scale integration, etc.)

599 ... With electrical circuit layout

600 ... Using structure alterable to conductive state (i.e., antifuse)

601 ... Using structure alterable to nonconductive state (i.e., fuse)

602 .. To compound semiconductor

603 ... II-VI compound semiconductor

Refractory metals

From Wikipedia, the free encyclopedia

Refractory metals are a class of metals extraordinarily resistant to heat, wear, and corrosion. These properties make them useful in many applications. Household incandescent bulbs contain refractory metals in their tungsten filaments, and nearly all manufactured goods, particularly those containing metal or electronics, contain or were produced using refractory metals.

The five refractory metals are:

- Tungsten (W)
- Molybdenum (Mo)
- Niobium (Nb)
- Tantalum (Ta)
- Rhenium (Re)

Refractory metals are used in lighting, tools, lubricants, nuclear reaction control rods, as catalysts, and for their chemical or electrical properties. Because of their high melting point, refractory metal components are never fabricated by casting. The process of powder metallurgy is used. Powders of the pure metal are compacted, heated using electric current, and further fabricated by cold working with annealing steps. Refractory metals can be worked into wire, ingots, bars, sheets or foil.

Tungsten was discovered in 1781 by the Swedish chemist, Karl Wilhelm Scheele. Tungsten is both the most abundant of the refractory metals, and has the highest melting point of all metals, at 3,410C (6,170F). Tungsten wire filaments provide the vast majority of household incandescent lighting, but are also common in industrial lighting as electrodes in arc lamps. TIG-welding (Tungsten Inert Gas welding) or GTAW-welding (Gas Tungsten Arc welding) equipment uses a permanent, non-melting tungsten electrode. The most common use for tungsten is as the compound tungsten carbide in drill bits, machining and cutting tools. It also finds itself serving as a lubricant, antioxidant, in nozzles and bushings, as a protective coating and in many other ways. Tungsten can be found in printing inks, x-ray screens, photographic chemicals, in the processing of petroleum products, and flame proofing of textiles. Tungsten is also used by virtue of its strength and density, in applications ranging from weights in helicopter rotors and weapon projectiles to the heads of golf clubs. The largest reserves of tungsten are in China, with deposits in Korea, Bolivia, Australia, and other countries.

Molybdenum is the most commonly used of the refractory metals. Its most important use is as a strengthening alloy of steel. Structural tubing and piping often contains molybdenum, as do many stainless steels. Its strength at high temperatures, resistance to wear and low coefficient of friction are all properties which make it invaluable as an alloying compound. Its excellent anti-friction properties lead to its incorporation in greases and oils where reliability and performance are critical. Automotive constant-velocity joints use grease containing molybdenum. The compound sticks readily to metal and forms a very hard, friction resistant coating. Most of the world's molybdenum ore can be found in the USA and Canada.

Niobium is nearly always found together with tantalum, and was named after Niobe, the daughter of the mythical Greek king Tantalus for whom tantalum was named. Niobium has many uses, some of which it shares with other refractory metals. It is unique in that it can be worked through annealing to achieve a

wide range of strength and elasticity, and is the least dense of the refractory metals. It can also be found in electrolytic capacitors and in the most practical superconducting alloys. Niobium can be found in aircraft gas turbines, vacuum tubes and nuclear reactors.

Tantalum is one of the most corrosion resistant substances available. Many important uses have been found for tantalum owing to this property, particularly in the medical and surgical fields, and also in harsh acidic environments. It is also used to make superior electrolytic capacitors. Tantalum films provide the most capacitance per volume of any substance, and allow miniaturization of electronic components and circuitry. Cellular phones and computers contain tantalum capacitators.

Rhenium is the most recently discovered refractory metal. It is found in low concentrations with many other metals, in the ores of other refractory metals, platinum or copper ores. It is useful as an alloy to other refractory metals, where it adds ductility and tensile strength. Rhenium alloys are being found in electronic components, gyroscopes and nuclear reactors. Rhenium finds its most important use as a catalyst. It is used as a catalyst in reactions such as alkylation, dealkylation, hydrogenation and oxidation. However its rarity makes it the most expensive of the refractory metals.

The creep behavior of refractory metals

Refractory metals and alloys attract the attention of investigators because of their remarkable properties and on account of promising practical prospects.

Refractory metals are characterized by their extremely high melting points, which range well above those of iron and nickel. When the refractory metals are considered to be those metals melting at temperatures above 2123 K, twelve metals constitute this group: tungsten (the melting point 3683 K), rhenium, osmium, tantalum, molybdenum, iridium, niobium, ruthenium, hafnium, zirconium, vanadium, and chromium.

Physical properties of refractory metals, such as molybdenum, tantalum and tungsten, their strength, and high-temperature stability make them suitable material for hot metalworking applications and for vacuum furnace technology. Many special applications exploit these properties: for example, tungsten lamp filaments operate at temperatures up to 3073 K, and molybdenum furnace windings withstand to 2273 K.

However, a poor low-temperature fabricability and an extreme oxidability at high-temperatures are shortcomings of the most refractory metals. Interactions with environment can significantly influence on their high-temperature creep strength. Application of these metals requires a protective atmosphere or a coating.

The refractory metal alloys of molybdenum, niobium, tantalum, and tungsten have been applied for the space nuclear power systems. These systems were designed to operate at temperatures from 1350 K to approximately 1900 K. An environment must not interact with the material in question. Liquid alkali metals as the heat transfer fluids are used as well as the ultrahigh vacuum.

The high-temperature creep strain of alloys must be limited for them to be used. The creep strain should not exceed 1-2%. An additional complication in studying creep behavior of the refractory metals is interactions with environment, which can significantly influence the creep behavior.

Reference

Levitin, Valim (2006). *High Temperature Strain of Metals and Alloys: Physical Fundamentals*. WILEY-VCH. ISBN 978-3-527-31338-9.

See also

- Refractory ceramic

Retrieved from "http://en.wikipedia.org/wiki/Refractory_metals"

Categories: Metals | Refractory materials

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